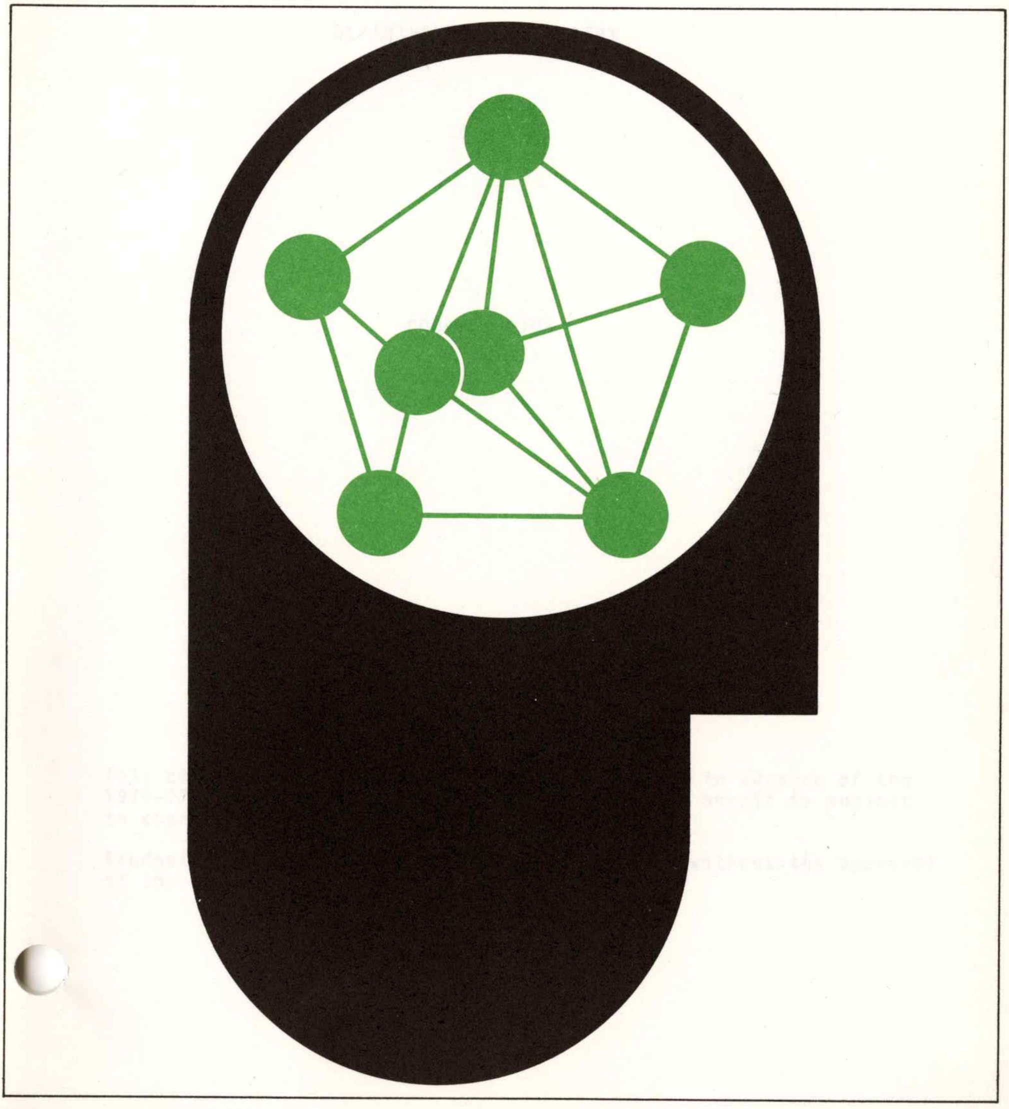
Science

concordia university

Sir George Williams
Faculty of Science

Chemistry



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SIR GEORGE WILLIAMS CAMPUS

DEPARTMENT OF CHEMISTRY

COURSE GUIDE

1976-77

This course guide has been prepared some months in advance of the 1976-77 academic year and information contained herein is subject to change.

Students are advised not to purchase any texts without the approval of the Department or Professor concerned.

FULL-TIME FACULTY

Associate Professor and Chairman of the Department

Roderick E. Townshend, Ph.D. (Ottawa)

Professors

Lawrence Colebrook, Ph.D. (Auckland)
James G. Dick, B.Sc. (S.G.W.U.) P. Chem.
John R. Ufford, Ph.D. (McGill)
T. Nogrady, Ph.D. (Budapest) (Adjunct Professor of Chemistry)
Roger H. Verschingel, Ph.D. (McGill), Dean of the Faculty of Science.

Associate Professors

Thomas J. Adley, Ph.D. (London)
Peter H. Bird, Ph.D. (Sheffield)
Zacharias Hamlet, Ph.D. (Notre Dame)
Jacques Lenoir, B.Sc. (S.G.W.U.)
Robin T.B. Rye, Ph.D. (London)
Nick Serpone, Ph.D. (Cornell)
Oswald S. Tee, Ph.D. (East Anglia)
Ronald Westbury, Ph.D. (McGill) P. Chem.

Assistant Professor

Judith Kornblatt, Ph.D. (Cincinnati)

Research Assistant Professor

Bhuvan C. Pant, Ph.D. (Sussex)

ALL STUDENTS INTERESTED IN THE CHEMISTRY OR BIOCHEMISTRY PROGRAMMES SHOULD VISIT OR CALL DR. T. ADLEY AT 879-5962 OR DR. J. KORNBLATT AT 879-4128

AIMS OF THE TEACHING PROGRAMME

- to provide the theory and practice of chemistry for students who will make chemistry their career
- to provide a background in chemistry for students who intend to enter graduate school
- to provide a knowledge of chemistry for students who will complete their studies in other areas

1. HONOURS IN CHEMISTRY:

- designed for students who plan to study chemistry beyond the undergraduate level
- a demanding programme, with high standards
- 15 specified courses (90 credits), taken in a set pattern

2. SPECIALIZED DEGREE IN CHEMISTRY:

- a less intensive programme than the honours programme; for students who wish to have an excellent grasp of the subject
- 10 required courses (60 credits) in Chemistry, but numerous electives in Chemistry are available
- other electives may be taken in Humanities, Social Sciences, and Commerce

3. SPECIALIZED DEGREE IN ANALYTICAL CHEMISTRY:

- 11 1/2 courses (69 credits) designed to enable a qualified student to work in analytical chemistry, as applied in industry

4. SPECIALIZED DEGREE IN BIOCHEMISTRY

- for students who wish to apply their knowledge of chemistry to biological systems
- calls for 13 courses (78 credits), from Chemistry and the Biological Sciences, but a variety of electives are available in these subjects
- offers electives from outside the Science Faculty

5. MAJOR IN GENERAL CHEMISTRY:

- 6 courses (36 credits) in an approved sequence constitute the new Major Programme

6. MINOR IN CHEMISTRY:

- a variety of 4-course (24 credit) programmes leading to a Minor in Chemistry can be arranged in consultation with the Department's undergraduate advisor

RECENT MERIT AWARDS IN THE CHEMISTRY DEPARTMENT

The Allied Chemical Canada Limited Scholarship
The Society of Chemical Industry Prize
The Corporation of Professional Chemists of Quebec Prize
The Chemical Institute of Canada Prize
The Mappin Medal in Science
The Henry I. Chinks Memorial Scholarship
The British Petroleum Prize

DEPARTMENTAL RESOURCES

- located on the 10th and 11th floors of the modern, air-conditioned Hall Building
- library facilities are conveniently located on the 10th floor
- resource room and study area open to all students in Chemistry
- modern calculating equipment is available to all Chemistry students
- audio-visual materials in the library for self-study in some courses
- students have ready access to teaching faculty
- all students gain experience in the use of modern electronic equipment

The Order of Professional Chemists of Quebec has fully accredited the curricula of Honours in Chemistry and the Specialized Degrees in Chemistry, Biochemistry and Analytical Chemistry. Upon satisfactory completion of one of these programmes a graduate is eligible for membership in the Order.

COURSE NUMBER: Chemistry N-201
COURSE TITLE: General Chemistry I
PROFESSORS: Day } Co-ordinator
Evening } Dr. B.C. Pant

LECTURES: MWF 9:50-10:40
Th 20:30-22:25
LABORATORY: 4 hrs/WEEK

COURSE DESCRIPTION

States of matter. Atoms, elements and isotopes; atomic structures. The electronic structure of atoms. The Periodic Table and chemical bonding. Ions in solution. Lectures, tutorials and laboratories.

The laboratory experiments are designed to make the theory discussed in lectures more relevant. Experiments will involve the identification of pure substances, a study of the gas laws, and an introduction to qualitative analytical techniques.

TEXTS

Brescia, Mehlman, Pellegrini, and Stambler: Chemistry - A Modern Introduction (Saunders) 1974

ASSIGNMENTS AND GRADING

The final grade will depend upon quizzes, examinations, term work, and laboratory work.

PRE-REQUISITE COURSES

None

FURTHER SPECIAL COMMENTS

1. 3 Credits
2. Science students may not take this course for credit.
3. Any student who has passed CEGEP Chemistry 101 may not take this course for credit.

COURSE NUMBER: Chemistry N-202
COURSE TITLE: General Chemistry II
PROFESSORS: Day } Co-ordinator
Evening } Dr. B.C. Pant

LECTURES: MWF 9:50-10:40
Tue 20:30-22:25
LABORATORY: 4 hrs/WEEK

COURSE DESCRIPTION

Covalent compounds. Chemical reactions; mechanism and kinetics. Special topics; oriented either to the biological sciences, biochemistry and chemistry, or to the physical sciences, engineering and computer sciences. Lectures, tutorial and laboratories.

Experimental work in the laboratory will complement the theory discussed in lectures as well as encourage proficiency in the use of modern laboratory practices. Some typical experiments involve rates of chemical reactions, equilibrium, identification and analysis of selected organic compounds. Experiments are designed to include some modern instrumental techniques.

TEXTS

Brescia, Mehlman, Pellegrini, and Stambler: Chemistry - A Modern Introduction (Saunders) 1974

ASSIGNMENTS AND GRADING

The final grade will depend upon quizzes, examinations, term work, and laboratory work.

PRE-REQUISITE COURSES

Chemistry N-201 or equivalent

FURTHER SPECIAL COMMENTS

1. 3 Credits.
2. Science students may not take this course for credit.
3. Any student who has passed CEGEP Chemistry 201 may not take this course for credit.

COURSE NUMBER: Chemistry N-211 DAY: Tue (Both terms)
COURSE TITLE: Introductory Quantitative Analysis TIME: 8:45-9:50 A.M.
PROFESSORS: Day } Prof. J.G. Dick
Evening

COURSE DESCRIPTION

Chemical equilibrium as applied to volumetric and gravimetric procedures; general theory of volumetric titrations; titration curves; application of general titration theory to neutralization precipitation, complexation, oxidation-reduction and non-aqueous solvent titrations; theory of potentiometry and potentiometric titrations; theory of gravimetric analysis; methods of separation by chemical and physical means; electrogravimetry and electrolytic separations; absorptimetric theory and absorptimetric methods of analysis. Lectures and laboratory.

TEXTS

Dick: Analytical Chemistry (McGraw-Hill) 1973

ASSIGNMENTS AND GRADING

Four written examinations will be given during the year. These will cover all of the work in the course from the beginning to the period of each examination, but with emphasis on the topics most recently discussed.

Term assignments will be given during the year and will be returned after grading. The marks given will be considered as contributory to the final grade assigned for the lecture and examination portion of the course.

Laboratory work will be graded according to performance in the laboratory, accuracy and precision of results and quality of the laboratory reports.

A satisfactory performance level must be attained in both the laboratory work and examination portions of the course.

PRE-REQUISITE COURSES

CEGEP Chemistry 201
CEGEP Physics 301 } or equivalent courses
CEGEP Mathematics 103 and 203

FURTHER SPECIAL COMMENTS

1. 4 Credits
2. The lectures are held one day a week in both terms. The laboratory is once a week for both terms.

COURSE NUMBER: Chemistry N-213 DAY: Th (Both terms)
COURSE TITLE: Statistical Treatment of Chemical Data TIME: 8:45-9:50 A.M.
PROFESSORS: Day } Dr. R.T.B. Rye
Evening } Dr. R.A. Westbury

COURSE DESCRIPTION

The statistical treatment of chemical data, including:- observations and measurements; error, accuracy and precision; significant figures and expression of results; probability theory, normal and Poisson error distributions; measures of spread; propagation of errors and rejection of observations; graphical analysis and accuracy of values derived from graphs; statistical analysis; regression and correlation; method of least squares for linear and non-linear relationships; analysis of variance. Lectures only.

TEXTS

A list of suitable references will be supplied in class.

ASSIGNMENTS AND GRADING

Four written examinations will be given during the year. These will cover all of the work in the course from the beginning to the period of each examination, but with emphasis on the topics most recently discussed. Term assignments will be given during the year and will be returned after grading. The marks given will be considered as contributory to the final grade assigned for the course.

PRE-REQUISITE COURSES

CEGEP Chemistry 201
CEGEP Physics 301 } or equivalent courses
CEGEP Mathematics 103 and 203

FURTHER SPECIAL COMMENTS

1. 2 Credits.

COURSE NUMBER: Chemistry N-222

COURSE TITLE: Introductory Inorganic Chemistry

DAY: TT - Day
Tue - Evening

TIME: 11:45-13:00 - Day
18:15-20:10 - Eve.

PROFESSORS: Day
Evening } Dr. P.H. Bird

COURSE DESCRIPTION

Atomic Structure: wave mechanical orbitals, atomic properties.
Ionic Bonding: structure, lattice energy.
Covalent Bonding: Electron pair repulsion theory, valence bond theory and hybridization. Molecular orbital theory, delocalization.
Solution Chemistry: Acid-base definitions, non-aqueous solvents. Experimental Methods.
Lectures and laboratory.

TEXTS

Mackay & Mackay: Introduction to Modern Inorganic Chemistry , 1st or 2nd ed. (Intertext).

ASSIGNMENTS AND GRADING

Approximately three short assignments will be given. There will be an exam during the 7th or 8th week and a final examination.

Laboratory work is evaluated on the basis of performance in the laboratory and on the quality of written reports.

Both written and laboratory performance must be satisfactory.

PRE-REQUISITE COURSES

CEGEP Chemistry 201
CEGEP Physics 301
CEGEP Mathematics 103 and 203

FURTHER SPECIAL COMMENTS

1. 3 Credits.
2. Text subject to change in Fall 1976.

COURSE NUMBER: Chemistry N-223

COURSE TITLE: Chemistry of the Main Group Elements

DAY: TT - Day
Tue - Evening

TIME: 11:45-13:00 - Day
18:15-20:10 - Eve.

PROFESSORS: Day
Evening } Dr. P.H. Bird

COURSE DESCRIPTION

Summary of periodic properties in terms of the general properties of atoms.

The descriptive chemistry of hydrogen, the s block elements and the p block elements. Lectures and laboratory.

TEXT

Mackay and Mackay: Introduction to Modern Inorganic Chemistry, 1st or 2nd Ed (Intertext).

ASSIGNMENTS AND GRADING

Approximately three short assignments will be given. There will be an exam in the 7th or 8th week of term, and a final examination.

Laboratory work is evaluated on the basis of performance in the laboratory and the quality of the written reports.

Both written and laboratory performance must be satisfactory.

PRE-REQUISITE COURSES

CEGEP Chemistry 201
CEGEP Physics 301
CEGEP Mathematics 103 and 203

FURTHER SPECIAL COMMENTS

1. 3 Credits.
2. Students are advised to take Chemistry N-222 before this course.
3. Textbook subject to change in Fall 1976.

COURSE NUMBER: Chemistry N-231 DAY: M W F
COURSE TITLE: Introductory Organic Chemistry TIME: 8:45-9:35
OR
10:55-11:45

PROFESSORS: Day } Dr. T.J. Adley
Dr. Z. Hamlet
Evening } Dr. L.D. Colebrook

COURSE DESCRIPTION

Chemistry of aliphatic and aromatic compounds; structural isomerism; stereoisomerism; mechanisms; electronic theories and stereochemistry of organic reactions; applications of spectroscopy to organic chemistry. Lectures and laboratory.

TEXTS

Allinger, Cava, De Jongh, Johnson, Lebel and Stevens: Organic Chemistry (Worth Publishers).

Rosenblatt and Davis: Laboratory Course in Organic Chemistry, 2nd Edition (Allyn and Bacon).

ASSIGNMENTS AND GRADING

There are two examinations in this course, at Christmas and at Easter. The final grade is based upon the results of these two examinations, and upon the work in the laboratory. Satisfactory performance is necessary in both the lecture material, and the laboratory work.

PRE-REQUISITE COURSES

CEGEP Chemistry 201 or an equivalent course.

FURTHER SPECIAL COMMENTS

1. 6 Credits.
2. Students who enter the University having taken one semester of organic chemistry may register for the second semester of this course - N233.

COURSE NUMBER: Chemistry N-233 DAY: M W F
COURSE TITLE: Introductory Organic Chemistry TIME: 8:45-9:35
OR
10:55-11:45

PROFESSORS: Day } Dr. T.J. Adley
Dr. Z. Hamlet
Evening } Dr. L.D. Colebrook

COURSE DESCRIPTION

Reactions and syntheses of aliphatic and aromatic compounds. Mechanisms and electronic theories of organic reactions. Applications of spectroscopy to organic chemistry. Lectures and laboratory.

TEXTS

Allinger, Cava, De Jongh, Johnson, Lebel and Stevens: Organic Chemistry (Worth Publishers).

Rosenblatt and Davis: Laboratory Course in Organic Chemistry, 2nd Edition (Allyn and Bacon).

ASSIGNMENTS AND GRADING

The grade is based upon the results of a single examination and upon work in the laboratory. A satisfactory level of performance must be maintained in both.

PRE-REQUISITE COURSES

CEGEP Chemistry 301 or an equivalent course

FURTHER SPECIAL COMMENTS

1. 3 Credits.
2. This course is identical with the second semester of Chemistry N-231.

COURSE NUMBER: Chemistry N-241 DAY: M W F
COURSE TITLE: Introductory Physical Chemistry TIME: 8:45-9:35
OR
10:55-11:45

PROFESSORS: Day } Dr. R.T. Rye
Dr. R.E. Townshend
Evening } Dr. R.A. Westbury

COURSE DESCRIPTION

Real gases; kinetic molecular theory; equilibrium thermodynamics (first, second and third laws); electrochemical cells and the Nernst equation; applications of thermodynamics to one-component, two-component and three-component systems; chemical kinetics; ions in solution. Lectures only.

Please see note 2 of Further Special Comments Section.

TEXTS

Daniels and Alberty: Physical Chemistry, 4th Edition (Wiley)

ASSIGNMENTS AND GRADING

There are four examinations in this course.

(a) First term quarterly - usually the end of October
(b) Christmas exam
(c) Second term quarterly - usually the end of February
(d) Easter exam

The overall final grade is based on the results of these four examinations.

PRE-REQUISITE COURSES

CEGEP Chemistry 201
CEGEP Physics 301
CEGEP Mathematics 103 and 203 } or equivalent courses

FURTHER SPECIAL COMMENTS

1. 6 Credits.

2. This course is strongly problem-solving oriented.

COURSE NUMBER: Chemistry N-281
COURSE TITLE: Industrial Inorganic Chemistry

PROFESSORS: Evening TO BE ANNOUNCED
(See Note 4 in Further Special Comments Section)

COURSE DESCRIPTION

This course concentrates on selected commercially important inorganic processes, and will include

(a) The sulphur and sulphuric acid industries
(b) The nitrogen and phosphorus industries
(c) Industries based upon sodium chloride
(d) The pulp and paper industry
(e) Industries based upon nuclear technology
(f) Other industries, as time permits

Please see note 2 in Further Special Comments Section.

TEXTS

Shreve: Chemical Process Industries (McGraw-Hill), 3rd Edition

ASSIGNMENTS AND GRADING

There are few, if any, assignments in this course.

The grade is based on one three-hour examination at the end of the course.

PRE-REQUISITE COURSES

CEGEP Chemistry 201 or an equivalent course.

FURTHER SPECIAL COMMENTS

1. 3 Credits.

2. The list of topics is tentative, and is subject to change, depending upon the wishes of the instructor, and of the class.

3. This course is not applicable towards any specialization offered by the Chemistry Department.

4. This course is offered in alternate years in the Evening Division. It will not be offered in 1976-77.

COURSE NUMBER: Chemistry N-311 DAY: M W F

COURSE TITLE: Electrochemical Methods of Analysis TIME: 8:45-9:35

PROFESSORS: Day
Evening } Prof. J.G. Dick

COURSE DESCRIPTION

The theory and application of instrumental methods of analysis to quantitative chemistry including: coulometry; coulometric titrations; conductometry; conductometric titrations; voltammetry and polarography; amperometric titrations; chronopotentiometry and chronoamperometry; spectrophotometry; spectrophotometric titrations; nephelometry, turbidimetry and fluorometry; flame photometry; atomic absorption spectroscopy; emission spectroscopy; x-ray absorption and emission (fluorescence) spectroscopy. Lectures and laboratory.

TEXTS

Dick: Analytical Chemistry (McGraw-Hill)

ASSIGNMENTS AND GRADING

Four written examinations will be given during the year. These will cover all of the work in the course from the beginning to the period of each examination, but with emphasis on the topics most recently discussed.

Term assignments will be given during the year and will be returned after grading. The marks given will be contributory to the final grade assigned for the lecture and examination portion of the course.

Laboratory work will be graded according to performance in the laboratory, accuracy and precision of results and the quality of the laboratory reports.

A satisfactory performance level must be attained in both the laboratory work and examination portions of the course.

PRE-REQUISITE COURSES

Chemistry N-211, N-213, N-222, N-223;
Chemistry N-350 and N-352 or N-350 and N-354 previously or concurrently.

FURTHER SPECIAL COMMENTS

1. 3 Credits.

COURSE NUMBER: Chemistry N-322 DAY: M W F (1st term)

COURSE TITLE: Introduction to Symmetry and Group Theory TIME: 12:00-12:50

PROFESSORS: Dr. N. Serpone

COURSE DESCRIPTION

Introduction to group theory. Symmetry and symmetry groups. Representations of groups. Character tables. Group theory and quantum mechanics. Hybrid orbitals. Symmetry aspects of molecular orbital theory. Polyatomic molecules. Ligand field theory. Relative energies of split levels. V.B. and M.O. theories of coordination compounds. Term energy level diagrams. Correlation diagrams. Racah parameters. Orgel diagrams. Tanabe-Sugamo diagrams. Selection rules and spectral intensities. Jahn-Teller effect. Laboratory work will consist of 5 assigned experiments. Observation will be recorded directly in a hard covered note book. Short reports will be done in the same note book and these are due one week from the scheduled completion date of the experiment. All products made must be submitted for examination and testing. Lectures and laboratory.

TEXTS

Cotton: Chemical Applications of Group Theory, 2nd Edition (Interscience)

Angelici: Synthesis and Technique in Inorganic Chemistry (Saunders)

ASSIGNMENTS AND GRADING

Final grades will be made up approximately as follows:

Laboratory - 20-30%

Assignments and tests - 30-40%

Final examination - balance

PRE-REQUISITE COURSES

Chemistry N-211, N-222, N-223 and Chemistry N-350 and N-354 previously or concurrently.

FURTHER SPECIAL COMMENTS

1. 3 Credits

2. Students who have credits for Chemistry N-321 may not take this course for credits.

COURSE NUMBER: Chemistry N-323
DAY: M W F (2nd term)
COURSE TITLE: Chemistry of the Transitional Elements
TIME: 12:00-12:50

PROFESSORS: Day } Dr. P.H. Bird
Evening } Dr. N. Serpone

COURSE DESCRIPTION

Coordination chemistry; structure, theory of bonding, reactivity of transition metal complexes of various coordination numbers. Descriptive chemistry of transition metals of various oxidation states. Organometallic chemistry. Inorganic chemistry in biological systems. Lectures and laboratory.

TEXTS

Cotton and Wilkinson: Advanced Inorganic Chemistry, 3rd Edition (Wiley)

Huheey: Inorganic Chemistry - Principles of Structure and Reactivity (Harper and Row)

Angelici: Synthesis and Techniques in Inorganic Chemistry (Saunders)

ASSIGNMENTS AND GRADING

There will be an examination at Christmas.

Laboratory work is evaluated on the basis of actual performance at the bench and on written reports.

The final grade for the course is based upon both the examination and the laboratory.

Satisfactory performance is required in both the examination and the laboratory.

PRE-REQUISITE COURSES

Chemistry N-211, N-222, N-223, Chemistry N-350 and N-354 or Chemistry N-350 and N-352 previously or concurrently.

FURTHER SPECIAL COMMENTS

1. 3 Credits.
2. Students who have credits for Chemistry N-321 may not take this course for credits.

COURSE NUMBER: Chemistry N-331
DAY: T T
COURSE TITLE: Intermediate Organic Chemistry
TIME: 11:45-13:00

PROFESSORS: Day } Dr. O.S. Tee
Evening } Assoc. Prof.J. Lenoir

COURSE DESCRIPTION

Amplification of concepts presented in introductory organic chemistry; reaction mechanisms; catalysis; conformational analysis and stereochemistry. Laboratory includes qualitative analysis of compounds and mixtures by spectroscopic techniques; small scale preparations; selected experiments in physical organic chemistry. Lectures and laboratory.

TEXTS

Pasto and Johnson: Organic Structure Determination (Prentice-Hall)

March: Advanced Organic Chemistry; Reactions, Mechanism and Structure (McGraw-Hill)

ASSIGNMENTS AND GRADING

1) Two written examinations, each of equal weight
2) Assignments
3) Laboratory work graded on performance, results and report quality
4) Separate satisfactory levels for examinations and laboratory work.

PRE-REQUISITE COURSES

Chemistry N-231, N-241; Chemistry N-350 and N-354 or Chemistry N-350 and N-352 previously or concurrently.

FURTHER SPECIAL COMMENTS

1. 6 Credits
2. The laboratory work is conducted only in the second term.

COURSE NUMBER: Chemistry N-336 DAY: Summer Session

COURSE TITLE: Natural Products I

PROFESSORS: TO BE ANNOUNCED

COURSE DESCRIPTION

Structures, stereochemistry and reactions of carbohydrates; synthesis, stereochemistry and physiochemical properties of amino-acids; determination of amino-acid sequences; synthetic methods; conformations of polypeptides and proteins. Lectures only.

TEXTS

Guthrie and Honeyman: Introduction to the Chemistry of Carbohydrates (Oxford) 3rd Edition

Kopple: Peptides and Amino Acids (Benjamin)

ASSIGNMENTS AND GRADING

The final grade is commonly based on the results of the final examination. A term paper is, however, required of all students, and may enhance the grade.

PRE-REQUISITE COURSES

Chemistry N-231

FURTHER SPECIAL COMMENTS

1. 3 Credits.
2. This course is normally offered in the Summer session.

COURSE NUMBER: Chemistry N-337 DAY: EVENING ONLY
Wed.
20:30-22:25

COURSE TITLE: Natural Products II

PROFESSORS: TO BE ANNOUNCED

COURSE DESCRIPTION

The synthesis, stereochemistry and structure determination of lipids (triglycerides, phospholipids, sphingolipids and sterols); steroid hormones; antibiotics; nucleotides. Lectures only.

TEXTS

Ulbricht: Purines, Pyrimidines and Nucleotides and the Chemistry of Nucleic Acids (Pergamon)

Yates: Structure Determination (Benjamin)

ASSIGNMENTS AND GRADING

The final mark for this course is commonly based on the results of a final examination. However, when a major term paper is assigned, from 30-50% of the final mark is based on the term paper.

PRE-REQUISITE COURSES

Chemistry N-231

FURTHER SPECIAL COMMENTS

1. 3 Credits.

EVENING ONLY

COURSE NUMBER: Chemistry N-338 Th. 20:30-22:25

COURSE TITLE: Chemistry of High Polymers I

PROFESSORS: Evening - TO BE ANNOUNCED

COURSE DESCRIPTION

Methods and mechanisms of polymer preparation; condensation polymerization; addition polymerization; ring opening reactions; vinyl and diene polymers; polyesters; polyamides; polythioethers; properties of polymers and their related monomers. Lectures only.

TEXTS

Lenz: Organic Chemistry of Synthetic High Polymers (Wiley)

ASSIGNMENTS AND GRADING

The final overall grade will be assessed on the basis of both a mid-term examination (counting for 30-40%) and the final examination (counting for 60-70%).

PRE-REQUISITE COURSES

Chemistry N-231, N-241

FURTHER SPECIAL COMMENTS

1. 3 Credits.
2. This course is offered in the Evening Division only.

COURSE NUMBER: Chemistry N-342 DAY: M W F (1st term only)

COURSE TITLE: Chemical Kinetics TIME: 12:00-12:50

PROFESSORS: Day } Dr. R.T. Rye (Lectures)
Evening } Dr. R.A. Westbury (Laboratory)

COURSE DESCRIPTION

Topics in chemical kinetics including the analysis of kinetic results; the measurement of reaction rates; mechanisms of elementary reactions; elementary reactions in the gas-phase and in solution; complex reactions; homogeneous catalysis. Lectures and laboratory - one term.

TEXTS

Laidler: Chemical Kinetics (McGraw-Hill, 2nd edition)

Daniels, et. al: Experimental Physical Chemistry (McGraw-Hill, 7th edition)

ASSIGNMENTS AND GRADING

The final mark is based upon:

(a) The term end exam covering the entire course material (50%).

(b) The mid term examination (30%).

(c) A mark representative of performance in the laboratory (20%).

(d) Problem assignments - these do not count toward the final grade, but are a required part of the course. Failure to complete 80% of the assigned problems will result in a grade of "incomplete".

PRE-REQUISITE COURSES

Chemistry N-241

FURTHER SPECIAL NOTES

1. 3 credits.
2. Students are expected to solve a considerable number of chemical and mathematical problems in this course.

COURSE NUMBER: Chemistry N-343

DAY: M W F (2nd term only)

COURSE TITLE: Intermediate Thermodynamics

TIME: 12:00-12:50

PROFESSORS: Day } Dr. R.A. Westbury
Evening }

COURSE DESCRIPTION

Partial molal properties; thermodynamic treatment of real gases, and gas mixtures; fugacities and activities; determination of activities of nonelectrolytes and electrolytes. Lectures and laboratory.

TEXTS

Denbigh: Principles of Chemical Equilibrium, 3rd Edition (Cambridge University Press)

Daniels, et al: Experimental Physical Chemistry, 7th Edition (McGraw-Hill)

ASSIGNMENTS AND GRADING

The final mark is based upon:

(a) a mid-term exam, given after about six weeks of lectures

(b) a final three-hour exam, held during the University's regular examination period.

(c) a mark representative of performance in the laboratory

PRE-REQUISITE COURSES

Chemistry N-241

FURTHER SPECIAL COMMENTS

1. 3 Credits.

2. Students are expected to solve a considerable number of chemical and mathematical problems in this course.

3. Students who have credit for Chemistry N-341 may not take this course for credit.

COURSE NUMBER: Chemistry N-346

EVENING ONLY

Th. 20:30-22:25

COURSE TITLE: Chemistry of High Polymers II

PROFESSORS: Evening Dr. R.E. Townshend

COURSE DESCRIPTION

Study of the physical chemistry of high polymers including: examination of the physical properties of polymers; methods for studying polymers; polymer solution theory; molecular weight distributions and fractionation; molecular weight determinations by colligative properties, light scattering and ultracentrifuge techniques; mechanisms and kinetics of condensation and addition, polymerization; free radical and ionic polymerization. Lectures only.

TEXTS

Billmeyer: Textbook of Polymer Science (Interscience, 2nd Edition)

ASSIGNMENTS AND GRADING

The final overall grade will be assessed on the basis of both a mid-term examination, and the final examination. Students should inquire early in the course concerning the relative importance of each examination.

PRE-REQUISITE COURSES

Chemistry N-231, N-241

FURTHER SPECIAL COMMENTS

1. 3 Credits.

2. This course is offered in the Evening Division only.

COURSE NUMBER: Chemistry N-350 — DAY: T T (1st Term)

COURSE TITLE: Introductory Chemical Instrumentation — TIME: 10:15-11:30
Eve: Th. 18:15-20:10

PROFESSORS: Day, Evening } Dr. T.J. Adley

COURSE DESCRIPTION

Basic principles and applications of U.V., IR, Raman, Fluorescence, phosphorescence, NMR, EPR and Mass spectrometry to chemistry and biochemistry. Lectures and laboratory.

TEXTS

Pasto and Johnson: Organic Structure Determination (Prentice-Hall)

Reference: Brittain, George and Wells: Introduction to Molecular Spectroscopy

ASSIGNMENTS AND GRADING

The student's performance will be evaluated on the basis of class tests (2), a written examination (1), and laboratory performance. The laboratory will consist in part of the identification of "unknown" compounds and the work will be graded on the basis of laboratory performance, results and quality of the report.

PRE-REQUISITE COURSES

Chemistry N-231, N-211 and N-213 or
Chemistry N-231 and Biology N-203

FURTHER SPECIAL COMMENTS

1. 3 Credits.
2. This course is intended primarily for students specializing in either Chemistry or Biochemistry.

COURSE NUMBER: Chemistry N-352 — DAY: T T (2nd Term)

COURSE TITLE: Practice of Biochemical Techniques — TIME: 10:15-11:30
Eve: Th. 18:15-20:10

PROFESSORS: Day, Evening } Assoc. Prof. J. Lenoir

COURSE DESCRIPTION

Basic principles and applications of gas chromatography, column chromatography, thin-layer chromatography, gel filtration and electrophoresis; introduction to optical rotary dispersion. Lectures and laboratory.

TEXTS

A list of suitable references will be handed out in class.

ASSIGNMENTS AND GRADING

The course will be evaluated on the basis of class tests, and a final examination. The laboratory work will be graded on the basis of performance, results, and quality of reports.

PRE-REQUISITE COURSES

Chemistry N-350

FURTHER SPECIAL COMMENTS

1. 3 Credits.
2. Students who have credits for Chemistry N-351 may not take this course for credit.

COURSE NUMBER: Chemistry N-354 DAY: T T (2nd term)

COURSE TITLE: Introductory Instrumentation TIME: 10:15-11:30

PROFESSORS: Day
Evening } Dr. R. Verschingel

COURSE DESCRIPTION

Electronics applied to chemical measurements. Resistive, capacitive and inductive devices for measurement and control. Servo systems. Electronic switching and amplification. Logic and digital systems for measurement and control in the chemistry laboratory. Lectures and laboratory.

TEXTS

Malmstadt and Enke: Electronic Measurements for Scientists (Benjamin)

ASSIGNMENTS AND GRADING

The final grade will be based on:

(a) laboratory assignments and reports

(b) laboratory and class tests

(c) a final examination

PRE-REQUISITE COURSES

Chemistry N-211, N-213

OR

Biology N-202, N-203, N-380 (concurrently)

FURTHER SPECIAL COMMENTS

1. 3 Credits.
2. Students who have credits for Chemistry N-353 may not take this course for credits.

COURSE NUMBER: Chemistry N-371 DAY: M W F

COURSE TITLE: General Biochemistry TIME: 9:50-10:40
Eve.: Tue.
20:30-22:25

PROFESSORS: Day } Dr. J. Kornblatt
Evening } Dr. J. Parkes

COURSE DESCRIPTION

Protein structure and function, including enzymology; metabolic pathways and their control, with the emphasis on mammalian metabolism; biosynthesis of nucleic acids and proteins. Lectures and laboratory.

TEXTS

Stryer: Biochemistry

ASSIGNMENTS AND GRADING

Final grade will be based on:

1) hour exams
2) laboratory reports
3) final examination

PRE-REQUISITE COURSES

Chemistry N-231 and 6 credits in Biological Sciences at the university level, Chemistry students must have, in addition, Chemistry N-211 and N-241. Biological Science students must have, in addition, 6 credits in Biological Sciences at the university level.

FURTHER SPECIAL COMMENTS

1. 6 Credits.

COURSE NUMBER: Chemistry N-380

COURSE TITLE: General Industrial Chemistry

PROFESSORS: Evening - Not being offered in 1976-77 academic year

COURSE DESCRIPTION

Broad outline of major factors to be considered by the chemical industry when contemplating manufacture of a new product or product group - with special emphasis on market determination; customs; tariffs; use of Statistics Canada data; existing or potential competition; inherent advantages or disadvantages; relative importance of labour versus capital; plant location; transportation considerations; by-product disposition; hazard and pollution considerations; government regulated products; government incentives; marketing channels; export considerations; foreign tariffs and non-tariff barriers. Lectures only.

TEXTS

ASSIGNMENTS AND GRADING

PRE-REQUISITE COURSES

Second year chemistry students or permission of the Department

FURTHER SPECIAL COMMENTS

1. 3 Credits.
2. This course is occasionally offered in the Summer session.

COURSE NUMBER: Chemistry N-382

EVENING ONLY
Mon 20:30-22:25
(1st Term only)

COURSE TITLE: Industrial Organic Chemistry I

PROFESSORS: Evening - Dr. J. Dixon

COURSE DESCRIPTION

Study of selected industrial organic processes, including:

(a) The petroleum industry and petrochemicals
(b) The dyestuff industry
(c) Pharmaceuticals
(d) Soaps and detergents
(e) Other organic processing industries, as time permits.

N.B. Please see note 2 in Further Speical Comments Section.

TEXTS

Shreve: Chemical Process Industries (McGraw-Hill, 3rd Edition)

ASSIGNMENTS AND GRADING

There are few, if any, assignments in this course.

The grade is based on one three-hour examination at the end of the course.

PRE-REQUISITE COURSES

Chemistry N-231

FURTHER SPECIAL COMMENTS

1. 3 Credits.
2. The list of topics is tentative, and is subject to change, depending upon the wishes of the instructor, and of the class.
3. This course is not applicable towards any specialization offered by the Chemistry Department.

COURSE NUMBER: Chemistry N-383 — EVENING ONLY

COURSE TITLE: Industrial Organic Chemistry II — Mon. 20:30-22:25 (2nd Term only)

PROFESSORS: Evening - TO BE ANNOUNCED

COURSE DESCRIPTION

Study of further industrial organic processes, not covered in Chemistry N-382. The topics might include:

(a) The explosives industry
(b) The sugar and starch industries
(c) The plastics industry
(d) The rubber industry

N.B. Please see note 2 in Further Special Comments Section.

TEXTS

Shreve: Chemical Process Industries (McGraw-Hill, 3rd Edition)

ASSIGNMENTS AND GRADING

There are few, if any, assignments in this course.

The grade is based on one three-hour examination at the end of the course.

PRE-REQUISITE COURSES

Chemistry N-231

FURTHER SPECIAL COMMENTS

1. 3 Credits.
2. The list of topics is tentative, and is subject to change, depending upon the wishes of the instructor, and of the class.
3. This course is not applicable towards any specialization offered by the Chemistry Department.

COURSE NUMBER: Chemistry N-411 — EVENING ONLY (1976-77)

COURSE TITLE: Optical Methods of Analysis

DAY: Tue.

TIME: 18:15-20:10

PROFESSORS: Prof. J.G. Dick

COURSE DESCRIPTION

This course deals with aspects of absorptimetry and absorptimetric titrations, nephelometry, tubidimetry and fluorometry. Applications of emission spectroscopy, flame spectroscopy, atomic absorption and x-ray spectrometry to analytical chemistry will be discussed.

TEXTS

TO BE ANNOUNCED

PRE-REQUISITE COURSES

Chemistry N-211, N-213, N-231, N-222, N-223

FURTHER SPECIAL COMMENTS

1. 3 Credits.

COURSE NUMBER: Chemistry N-419 DAY: HOURS TO BE ARRANGED
COURSE TITLE: Analytical Chemistry EVENING: HOURS TO BE ARRANGED
PROFESSORS: TO BE ARRANGED

COURSE DESCRIPTION

Research project and thesis. The student will work on a research project involving a theoretical and/or practical aspects of analytical chemistry and will write a thesis on the results. The research project will be approved by a committee of members of the Department.

TEXTS

As assigned

ASSIGNMENTS AND GRADING

The final grade will be based upon the student's performance in the laboratory and the thesis resulting therefrom.

PRE-REQUISITE COURSES

The student must be enrolled in the major in Analytical Chemistry programme. Students in their final undergraduate year are normally eligible to take this course.

FURTHER SPECIAL COMMENTS

1. 6 Credits.
2. Students wishing to take this course should make known their intention to Prof. J.G. Dick, 879-4161.

COURSE NUMBER: Chemistry N-431 DAY: T T
COURSE TITLE: Advanced Organic Chemistry TIME: 10:15-11:30
PROFESSORS: Day } Dr. L.D. Colebrook
Evening } Dr. O.S. Tee

COURSE DESCRIPTION

Advanced stereochemistry: Physical and chemical aspects of stereochemistry, atropisomerism, asymmetric induction, and diastereoisomerism. Principles of synthesis. Syntheses of natural products and novel structures. Laboratory includes experiments in physical organic chemistry, synthetic and instrumental methods. Lectures and laboratory.

TEXTS

TO BE ANNOUNCED

ASSIGNMENTS AND GRADING

1) Three written examinations, each of equal weight.
2) Laboratory work graded on performance, results and report quality.
3) Separate satisfactory levels for examinations and laboratory work.
4) Assignments

PRE-REQUISITE COURSES

Chemistry N-311, N-342, N-343, N-350

FURTHER SPECIAL COMMENTS

1. 6 Credits.
2. This course is offered in alternate years in the Day and Evening division.

COURSE NUMBER: Chemistry N-442

DAY: Tue. (1st term only)

COURSE TITLE: Statistical Thermodynamics

TIME: 18:15-20:10

PROFESSORS: Evening - Dr. R. Townshend

COURSE DESCRIPTION

Elements of probability theory; microcanonical, canonical and grand canonical ensembles; the Boltzmann distribution; quantum mechanical treatment of an ideal gas; Fermi-Dirac and Bose-Einstein statistics; Einstein and Debye models of a monoatomic crystal; conformation of polymer chains.

TEXTS

Andrews: Equilibrium Statistical Mechanics (Wiley)

ASSIGNMENTS AND GRADING

The final grade will be based upon:

(a) an examination at Christmas time

(b) assignments handed in during the term

PRE-REQUISITE COURSES

Chemistry N-342, N-343

FURTHER SPECIAL COMMENTS

1. 3 Credits.
2. Students who have credits for Chemistry N-441 may not take this course for credits.

COURSE NUMBER: Chemistry N-443

DAY: Tue. (2nd term only)

COURSE TITLE: Advanced Thermodynamics

TIME: 18:15-20:10

PROFESSORS: Evening - Dr. R.A. Westbury

COURSE DESCRIPTION

Advanced topics in classical thermodynamics, comprising equilibrium and non-equilibrium approaches to selected systems. Methods of determination of activities; the free-energy function and its applications; thermodynamics of solids; estimation of thermodynamic properties; de Donder's concepts; fused salts; high temperature thermodynamics.

TEXTS

To be announced in class

ASSIGNMENTS AND GRADING

The final grade will be based upon:

(a) an examination at Easter time

(b) assignments handed in during the term

PRE-REQUISITE COURSES

Chemistry N-342, N-343

FURTHER SPECIAL COMMENTS

1. 3 Credits.
2. Students who have credits for Chemistry N-441 may not take this course for credits.

COURSE NUMBER: Chemistry N-445
DAY: Wed.
TIME: 14:00-18:00

COURSE TITLE: Advanced Physical Chemistry Laboratory

PROFESSORS: Dr. R.T. Rye
Dr. R.E. Townshend

COURSE DESCRIPTION

The laboratory associated with Chemistry N-442[3] and N-443[3] will be separated from the lectures and will form a laboratory course N-445 (3 credits) consisting of 26 weeks of 4 hours per week. The laboratory experiments will cover the fields of Chemical Kinetics and Thermodynamics. Fairly extensive laboratory reports will be required for each experiment performed and an examination will be held at the termination of the course.

TEXTS

TO BE ANNOUNCED

ASSIGNMENTS AND GRADING

The Final Grade will be based upon laboratory performance, reports and a final examination.

PRE-REQUISITE COURSES

Chemistry N-342 and N-343

FURTHER SPECIAL COMMENTS

1. 3 Credits.
2. Students who have taken N-442 or N-443 prior to 1975-76 may not take this course for credit.
3. This course is offered in the Evening division in 1976-77 and alternate year.

COURSE NUMBER: Chemistry N-452
DAY: Tue (2nd term only)
TIME: 20:30-22:25

COURSE TITLE: Chemical Spectroscopy

PROFESSORS: Dr. Z. Hamlet

COURSE DESCRIPTION

General aspects of spectroscopic techniques, energy states of atoms and molecules; interaction of electromagnetic radiation with matter; electron paramagnetic resonance spectroscopy, theory and applications to structure elucidation; rotational and rotational-vibrational spectroscopy of symmetrical top and asymmetrical top molecules; vibrational spectroscopy, symmetry properties of molecules and vibrational spectra, hydrogen bonding studies and analytical applications of ir spectroscopy; Raman spectroscopy, Resonance Raman spectroscopy and their applications; Electronic spectroscopy; spectrophotometry, spectrofluorometry and their analytical applications. Lectures and laboratory.

TEXTS

Brittain, George and Wells: Introduction to Molecular Spectroscopy, (Academic Press) 1970

Banwell: Fundamentals of Molecular Spectroscopy (McGraw-Hill) 1972

ASSIGNMENTS AND GRADING

The evaluation is based on examinations (two) and laboratory assignments and reports. Separate satisfactory levels needed for examinations and laboratory work.

FURTHER SPECIAL COMMENTS

1. 3 Credits.
2. This course is offered in alternate years in Day or Evening division.

COURSE NUMBER: Chemistry N-453

EVENING ONLY
1ST TERM ONLY

COURSE TITLE: Advanced Analytical Instrumentation

DAY: Tue.
TIME: 20:30-22:25

PROFESSORS: Day } Dr. R. Verschingel
Evening }

COURSE DESCRIPTION

Measurements of varying analog signals. Time domains and conversions. Digital converters and measurement systems. Optimization of electronic measurements and controls. Applications of microprocessors in the chemistry laboratory. Lectures and laboratory.

TEXTS

Malmstadt and Enke: Electronic Measurements for Scientists (Benjamin)

ASSIGNMENTS AND GRADING

The final grade will be based on:

(a) laboratory assignments and reports
(b) laboratory and class tests
(c) a final examination

PRE-REQUISITE COURSES

Chemistry N-354

FURTHER SPECIAL COMMENTS

1. 3 Credits.
2. Students who have credits for Chemistry N-451 may not take this course for credits.
3. This course is offered in alternate years in Day or Evening Division.

COURSE NUMBER: Chemistry N-462

SEE NOTE 2 IN FURTHER SPECIAL COMMENTS SECTION

COURSE TITLE: Introduction to Quantum Chemistry

PROFESSORS: Dr. J.R. Ufford

COURSE DESCRIPTION

Development of wave theory, variational and perturbational approaches. Principles of Quantum Theory. Free electron model for conjugated systems. The hydrogen atom, the helium atom, the periodic system. Electron correlation. Lectures only.

TEXTS

La Paglia: Introductory Quantum Chemistry (Harper and Row)

ASSIGNMENTS AND GRADING

The final grade is based on assignments and examinations.

PRE-REQUISITE COURSES

Chemistry N-222, N-223, N-241, N-231

FURTHER SPECIAL COMMENTS

1. 3 Credits.
2. This course will not be offered in 1976-77.

COURSE NUMBER: Chemistry N-463

COURSE TITLE: Valence Theory

SEE NOTE 2 IN FURTHER SPECIAL COMMENTS SECTION

PROFESSORS: Dr. J.R. Ufford

COURSE DESCRIPTION

The diatomic molecule, the hydrogen molecule ion, simple LCAO, general LCAO, symmetry, the secular equation, homo-nuclear diatomic molecules, hetero-nuclear diatomic molecules, valence bond theory, molecular orbital theory. Polyatomic molecules. Pi electron theory, ligand field theory. Lectures only.

TEXTS

La Paglia: Introductory Quantum Chemistry (Harper and Row)

ASSIGNMENTS AND GRADING

The final grade is based on assignments and a final examination.

PRE-REQUISITE COURSES

Chemistry N-222, N-223, N-241, N-231, N-462

FURTHER SPECIAL COMMENTS

1. 3 Credits.
2. This course will not be offered in 1976-77.

COURSE NUMBER: Chemistry N-471

DAY: Mon.

TIME: 18:15-20:10

COURSE TITLE: Advanced Biochemistry I

PROFESSORS: Day } Dr. J. Kornblatt
Evening

COURSE DESCRIPTION

A detailed study of enzymes and proteins; enzyme kinetics, both steady state and non-steady-state; enzyme mechanisms and the functions of metals and coenzymes in enzymic reactions; protein structure and methods used for its study. The laboratory will consist of a series of experiments on various steps in protein synthesis and will include experiments on enzyme purification and kinetics. Use of radioisotopes and sucrose gradient centrifugation. Lectures and laboratory.

TEXTS

TO BE ANNOUNCED

ASSIGNMENTS AND GRADING

Final grade will be based on hour exams and laboratory reports

PRE-REQUISITE COURSES

Chemistry N-350 and N-352, N-371

FURTHER SPECIAL COMMENTS

1. 6 Credits.

COURSE NUMBER: Chemistry N-472

COURSE TITLE: Advanced Biochemistry II

PROFESSORS: NOT GIVEN IN 1976-77

COURSE DESCRIPTION

Selected topics from the general areas of structural biochemistry; biosynthetic pathways; lipids; carbohydrates; nucleic acids. Lectures and laboratory.

TEXTS

TO BE ANNOUNCED

ASSIGNMENTS AND GRADING

PRE-REQUISITE COURSES

Chemistry N-371, N-350, N-352

FURTHER SPECIAL COMMENTS

1. 6 Credits.

COURSE NUMBER: Chemistry N-481

EVENING ONLY

COURSE TITLE: Industrial Synthetic Chemistry

Day: Tue.

TIME: 20:30-22:25

PROFESSORS: Evening - Assoc. Prof. J. Lenoir

COURSE DESCRIPTION

Selected fields of study in the industrial synthesis of fine chemicals, pharmaceutical intermediates, dyestuffs, pigments, agricultural chemicals and others. Group assignments will involve the scaling-up of laboratory synthesis to batch levels; evaluation of needs; search of patent literature, toxicology, pollution and other related industrial legislation. Lectures and laboratory.

N.B. Please see note 2 in Further Special Comments Section.

TEXTS

No assigned textbook in this course.

A list of selected references will be distributed in class.

ASSIGNMENTS AND GRADING

The final grade will be based upon:

(a) assignments
(b) laboratory reports
(c) performance in the laboratory

PRE-REQUISITE COURSES

Chemistry N-331, N-350 and N-354 or equivalents.

FURTHER SPECIAL COMMENTS

1. 3 Credits.

2. This course emphasizes the solution of problems commonly faced by a production chemist in industry.

3. This course is normally offered in the Evening division only.

COURSE NUMBER: Chemistry N-491 HOURS TO BE ARRANGED

COURSE TITLE: Research Project and Thesis

PROFESSORS: Day } STAFF OF THE DEPARTMENT
Evening

COURSE DESCRIPTION

The student will work on a research project under the direction of a staff member, and will write a thesis on the results.

N.B. Please see notes 2, 3, and 4, in Further Special Comments Section.

TEXTS

No assigned textbook in this course.

ASSIGNMENTS AND GRADING

The final grade is based upon:

(a) a public seminar describing the research done, in which the presentation, slides, etc., is expected to be of professional calibre.

(b) an oral examination by the faculty on the student's knowledge of all material germane to the research.

PRE-REQUISITE COURSES

Permission of the Department.

FURTHER SPECIAL COMMENTS

1. 6 Credits.
2. This course is required of final-year honours students. Some final-year major students may take it with special permission.
3. Students taking this course are required to attend departmental seminars.
4. Students planning to take this course should consult with the Chemistry Department as early as possible the year before the final year.
5. See the following pages for further special instructions.

SPECIAL INSTRUCTIONS

CHEMISTRY N-491

Admission

1. Students with a GPA of less than 2.5 in required courses for chemistry majors will not be eligible for admission to Chemistry N-491. The criterion for admission will be the compatibility of student, problem and supervisor.
2. In view of the 3 year undergraduate degree programme now in force the 2.5 GPA will now be assessed at the end of the second undergraduate year.
3. A student who shows talent or interest in a specific area in Chemistry will first be directed to all staff in that area for consultation. The student will not be assigned to any specific faculty member without such prior consultation.

The Projects

4. A list of the current research interests of faculty members who are prepared to supervise undergraduate projects is appended.
5. Since projects may differ in their degree of experimental and theoretical difficulty some consideration of this factor will enter the final mark evaluation procedure. The students' own contributions to the project will be an important consideration.
6. The nature of research is such that some research projects lend themselves to positive results in a relatively short time while other projects may be of a speculative nature and fail to yield instant results. For the latter case the course may provide a valuable screening mechanism for more extensive research projects while at the same time giving valuable experience to students. Bearing this in mind students are cautioned that "positive results" are neither guaranteed nor are they essential for a high grade.
7. A student will be expected to devote between 12 and 16 hours per week to the project. Experimental work will generally be concluded during the last week of classes. *

Thesis

8. An adequate command of written and spoken English or French is assumed. A mid-year report due the first week in the second term is mandatory. This report may be circulated to faculty members at the discretion of the project supervisor.

9. Students are required to prepare a typed final thesis which is their own work. The role of the project supervisor will be limited to counseling the student as to format and content. The supervisor will not participate in writing the thesis.

10. The format for the thesis should be based upon journals in the relevant fields.

Criteria for awarding grades

11. In addition to criteria given in items 5 and 6, students should note that among others any of the following constitute grounds for an F or Inc. grade.

    (a) Failure to submit a thesis.

    (b) Late submission of a thesis.

    (c) Inacceptable oral or written presentation of the work. Gross misuse of either the English or French languages may be considered as grounds for awarding an F grade.

    (d) Failure to accept direction from the project supervisor.

* A significant portion of the work should be carried out during the "normal working day" of the research supervisor. Students who present themselves at 9:00 P.M. and declare that they are prepared to commence work should be made aware that they are contravening the regulations of the course.